In-Flight Validation of ATSR data using Automated Validation Sites

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Abstract

In 1999 NASA's first Earth Observation System platform will be launched into earth orbit. Five instruments are mounted on the platform that will be used to produce a set of standard data products for the scientific community. The standard products include several products derived from the data acquired in the thermal infrared channels such as radiance at sensor, radiance at surface, surface temperature and surface emissivity. Similar products are being produced by instruments on-board the European ERS platforms such as the Along Track Scanning Radiometer (ATSR). It is essential that these products are validated to ensure the instruments and the standard product algorithms are functioning correctly.

In-flight validation of thermal infrared data is well established. Currently, this involves mounting validation campaigns in which researchers from several institutions make various ground and atmospheric measurements. The data from these campaigns are then used to propagate the surface radiance through the atmosphere to derive a radiance that can be compared directly with the radiance derived by the satellite- or aircraft- mounted sensor. In addition, the satellite- or aircraft derived sensor radiance can be compensated for atmospheric effects, using the data acquired in the campaign, to derive a surface radiance, temperature or emissivity that can be compared with the corresponding parameter measured on the surface. The primary difficulty with this validation approach is it results in a very limited number of seasonally restricted validation datasets. This difficulty arises for three reasons. First it is extremely difficult to mount large campaigns on a regular basis throughout the year. Second the orbit configuration of the instruments limits the number of times an area can be imaged in a given time interval. Third the season with the greatest chance of resulting in cloud-free data over the validation site

must be selected in order to maximize resource use. In order to address these limitations we are instrumenting a small number of sites to automatically obtain a basic set of validation data, under a range of atmospheres, throughout the year. The sites selected are L. Tahoe CA, USA, Hay, NSW, Australia, Amburla, NT, Australia and Thangoo, Broome, WA, Australia. Some of the sites are currently utilized for the semi-annual validation campaigns and these would provide an opportunity to supplement the basic validation parameters with additional field and airborne measurements.

Validation will involve comparison of the surface geophysical standard products with the ground measurements as well as propagation of the ground measurements through the atmosphere for comparison with the at sensor radiance. The necessary instrumentation is currently being deployed at the validation sites including several accurate and precise thermal infrared radiometers. In the case of L. Tahoe the radiometers will be mounted on buoys and the data transmitted to shore. We will discuss the instrumentation at each site and present some preliminary results from the new thermal infrared radiometers including comparisons with the ATSR.

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